[0066] To demonstrate the performance of the MCC algorithm, simulations with M=4 and 100,000 Monte-Carlo experiments were carried out. FIG. **4** shows the statistical distribution of the exemplary method herein under H_0 and H_1. In the left part of the figure, it is the distribution under H_0. It can be seen that the theoretical distribution coincides with statistical distribution. In the right part of the figure, it is the distribution of noisy signal with SNR=−4 dB, which separate well with that of H_0 situation. There is of great discrimination to a primary user signal.

[0067] FIG. **5** shows the ROC performance comparison of the instant MCC detector, CAV detector, MME detector, MET detector, CDC detector. The number of snapshots, N, is 50, there are four (M=4) antennas, and the SNR is −8 dB. P_d is the probability of detection. It is clear that the MCC detector performs better under the limited sample observations.

[0068] FIG. **6**, including FIGS. **6**A, **6**B, and **6**C, shows the performance comparison of MCC, CAV, MME, MET and CDC detectors for P_f=0.10 and N=50 (FIG. **6**A), N=100 (FIG. **6**B) and N=1024 (FIG. **6**C) separately (and also M=4). It is clear that MCC detector performs better than the CAV, MME, MET in the small P_f region irrespective of the sample size. The MCC detector even performs better than the CDC detector in small samples situation and little worse in large samples but still in the promised probability region. Moreover, the MCC detector does not need to perform the Cholesky factorization and the computation complexity is greatly reduced.

[0069] Without in any way limiting the scope, interpretation, or application of the claims appearing below, a technical effect of one or more of the example embodiments disclosed herein is to allow blind spectrum sensing to be performed of a frequency band to determine whether a primary user is using the frequency band, wherein the blind spectrum sensing is based at least in part on computation of one or more maximum correlation coefficients. Another technical effect is to allow a cognitive radio to determine whether a primary user is using the frequency band. A further technical effect is to allow the cognitive radio to use the frequency band in response to a determination the primary user is not using the frequency band or to not use the frequency band in response to a determination the primary user is using the frequency band.

[0070] Embodiments of the present invention may be implemented in software (executed by one or more processors), hardware (e.g., an application specific integrated circuit), or a combination of software and hardware. In an example embodiment, the software (e.g., application logic, an instruction set) is maintained on any one of various conventional computer-readable media. In the context of this document, a "computer-readable medium" may be any media or means that can contain, store, communicate, propagate or transport the instructions for use by or in connection with an instruction execution system, apparatus, or device, such as a computer, with one example of a computer described and depicted, e.g., in FIG. **1**. A computer-readable medium may comprise a computer-readable storage medium (e.g., memory(ies) **10**B or other device) that may be any media or means that can contain or store the instructions for use by or in connection with an instruction execution system, apparatus, or device, such as a computer. It is noted that a computer-readable storage medium does not encompass propagating signals.

[0071] If desired, the different functions discussed herein may be performed in a different order and/or concurrently with each other. Furthermore, if desired, one or more of the above-described functions may be optional or may be combined.

[0072] Although various aspects of the invention are set out in the independent claims, other aspects of the invention comprise other combinations of features from the described embodiments and/or the dependent claims with the features of the independent claims, and not solely the combinations explicitly set out in the claims.

[0073] It is also noted herein that while the above describes example embodiments of the invention, these descriptions should not be viewed in a limiting sense. Rather, there are several variations and modifications which may be made without departing from the scope of the present invention as defined in the appended claims.

[0074] The following abbreviations that may be found in the specification and/or the drawing figures are defined as follows:

[0075] ADC Analog-to-Digital Converter
[0076] ASIC Application Specific Integrated Circuit
[0077] CAV Covariance Absolute Value
[0078] CBS Cognitive Base Station
[0079] CDC Cholesky Decomposition of Covariance
[0080] CDF Cumulative Distribution Function
[0081] CR Cognitive Radio
[0082] CRN Cognitive Radio Network
[0083] CUs Cognitive User
[0084] DMM Difference of Maximum Minimum Eigen-value
[0085] DSA Dynamic Spectrum Access
[0086] ED Energy Detection
[0087] Eq. Equation
[0088] Eqs. Equations
[0089] EVD Eigen-Value-Decomposition
[0090] MCC Maximum Correlation Coefficient
[0091] MET Maximum Eigen-value Trace
[0092] MME Maximum Minimum Eigen-value
[0093] PBS Primary Base Station
[0094] PUs Primary Users
[0095] RF Radio Frequency
[0096] ROC Receiver Operating Characteristic
[0097] SNR Signal-to-Noise Ratio
[0098] SS Spectrum Sensing

What is claimed is:

1. A method, comprising:

performing blind spectrum sensing of a frequency band to determine whether a primary user is using the frequency band, wherein the blind spectrum sensing is based at least in part on a comparison between a detection statistic based on a maximum correlation coefficient, for correlations between a plurality of signals corresponding to a plurality of snapshots taken by a cognitive radio of the frequency band and corresponding to a plurality of antennas used by the cognitive radio for taking the snapshots, and a detection threshold based on theoretical computation of a distribution of the detection statistic; and

determining whether to communicate using the frequency band based on whether the blind spectrum sensing indicates the frequency band is or is not used by the primary user.